Gas Journal

VOL. 303. 112th YEAR. LONDON, SEPTEMBER 28, 1960. No. 5065. PRICE 1/6

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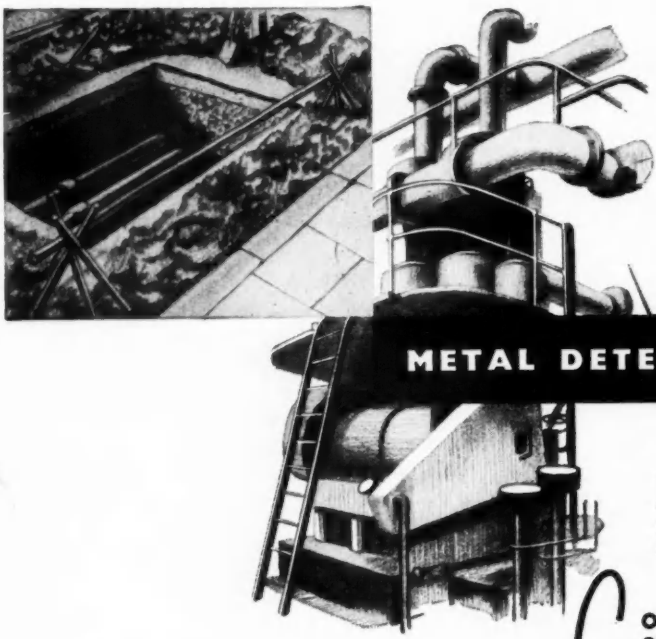

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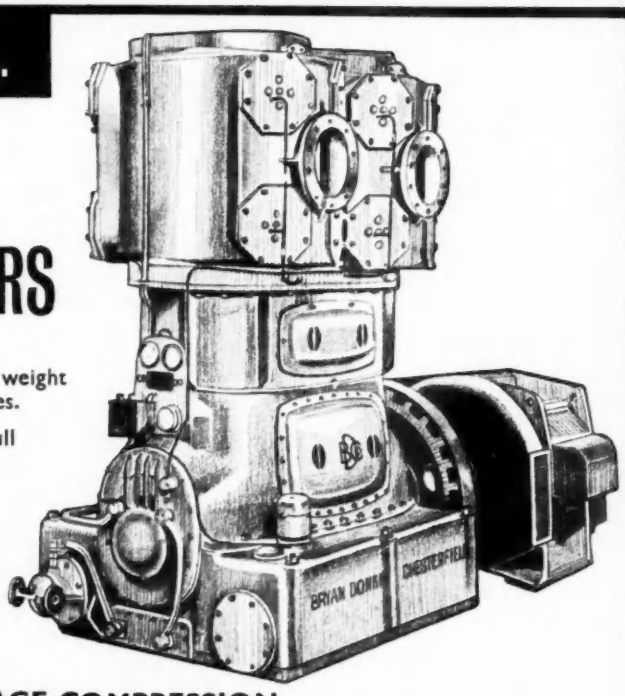

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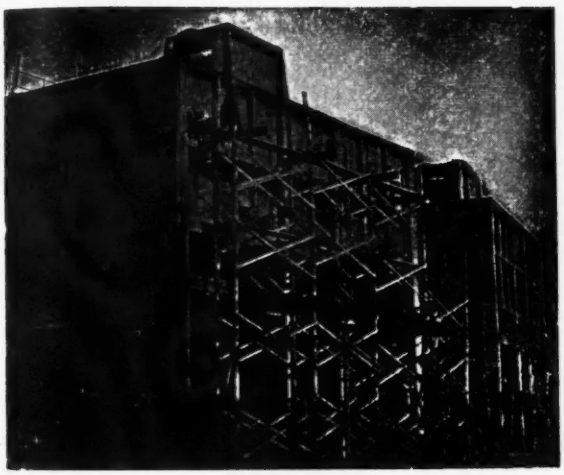

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Gas Journal

VOLUME 303 • NUMBER 5065 • 112th YEAR

WEDNESDAY, SEPTEMBER 28, 1960

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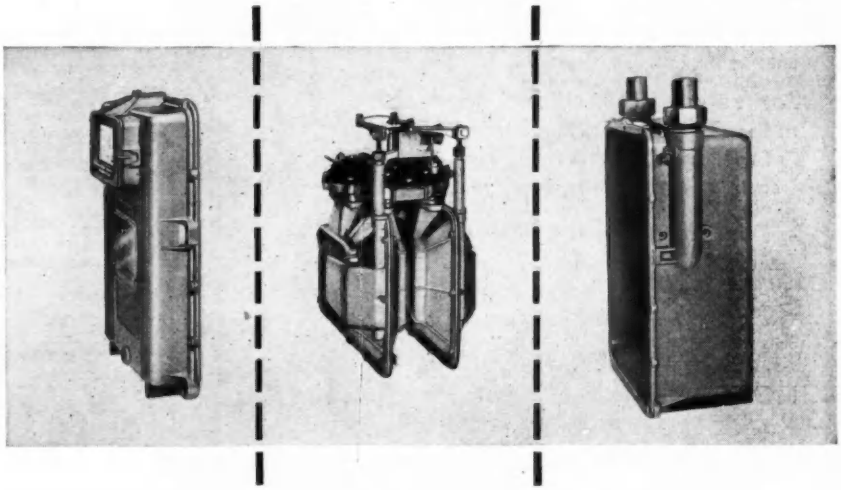

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Gas Journal

COKE OVENS • BY-PRODUCTS • CHEMICALS

Natural gas at Whitby

LAST Friday history was made in the North Riding of Yorkshire. In particular it was a great day for the ancient town of Whitby, where the Minister of Power, the Hon. Richard Wood, inaugurated the reforming plant at the gasworks which converted to a town gas of suitable characteristics a natural gas from wells at Aislaby and Grosmont in Eskdale some six miles away. Thus the ideal which many gas engineers have envisaged in the last few years has become a reality, and an important step forward has been taken in the history of gas production in this country.

For the first time an undertaking's area of distribution is being supplied exclusively from a source of natural gas. The old carbonising plant at the Whitby gasworks has been scrapped, but an emergency plant to supply butane to the reformer has been installed should there be any interruption in the flow of natural gas.

The pattern of gas production at Whitby is entirely new and should further investigation prove that the sources of natural gas far exceed the present estimates, the North Eastern Gas Board proposes to supply other small undertakings within reach of the wells.

It is now some seven years since Sir Harold Smith, then Chairman of the Gas Council, announced that a search for natural gas was to be made in Great Britain, and that £1 mill. was to be set aside over five years for this purpose. It is well known that in spite of all the efforts made on behalf of the gas industry by the BP Exploration Company, the results so far achieved have been most disappointing. The most promising sources of natural gas have been found at Cousland in Eastern Scotland and at Calo in Derbyshire; gas from the former well has taken its place in the Scottish grid system, while the Derbyshire source is still being developed.

The wells in Eskdale, at Aislaby and Grosmont, were not in fact discovered as a result of the Gas Council's survey. This particular gas field was originally located by the D'Arcy Exploration Company in 1938, when prospecting for oil. After the war I.C.I., in a search for potash, joined forces with the oil industry and developed this area. In the hope of finding gas in sufficient quantity to provide a raw material for chemical synthesis and so make the piping of the gas to Billingham, some 30 miles away, economic, ten wells in all were drilled. Since only two wells produced gas and a sufficient quantity was, therefore, not available for this purpose, the project was dropped. But the North Eastern Gas Board realised that here was an opportunity to make use of a source of gas suitable for reforming to a G5 gas for town gas distribution. Negotiation between the Board and the other two industries was successful, and the gas has become available for the gas industry.

In his speech at the luncheon that followed the inauguration ceremony, the Minister referred to this happy arrangement between a nationalised industry and private enterprise, and pointed out that any such working arrangements which would contribute to stabilising and maintaining competitive prices between gas and electricity should be encouraged. In spite of the increasing availability of electricity, there were still a great many people who were both interested in gas and wanted to use it. Industry was interested in its use, so were his staff at the Ministry of Power. Competition should remain between these two fuels, but since electricity did not suffer from some of the disadvantages with which gas might have to contend, he felt that any project which assisted the gas industry should have the greatest encouragement. In this way both industries would remain competitive.

Such an attitude towards an industry which is continually having to meet increases in costs from the rising prices of its raw materials was, we felt, at least an indication of the policy which the Minister was likely to follow when viewing the prospects of gas. With his encouragement to exploit and develop all possible means to reduce the cost of gas production, the 'backroom boys' and the research teams in the industry should have every confidence in going forward with new means of gasmaking.

To put the achievement of Whitby into its right perspective, it must be remembered that, unique though it is, it is essentially local and unfortunately cannot contribute to any great extent to the solution of cheaper gas supplies nationally. It has, however, shown the way in which a gas of high calorific value may be successfully reformed, so that should a sufficiently large source of natural gas ever become available, it could be reformed locally as needed. Should the decision be made to use imported liquefied methane or l.p.g. as a raw material for gasmaking, similar means might be adopted. In this way the consumer could buy his gas with confidence, knowing full well that whatever the source of supply, the

gas delivered to his premises would have constant characteristics.

Another property of the Eskdale natural gas is that it is free from organic sulphur. The comparatively small proportion of hydrogen sulphide in the gas from one of the wells is absorbed in oxide purifiers before reforming and the gas distributed is completely sulphur-free.

We were impressed by the small size of the plant, which emphasised how even in an old gasworks the use of modern plant and processes can vastly improve working conditions. The automatic and centrally controlled plant needs only one shift man to supervise it—another point in its favour. This modern gas-making plant is certainly a worthy successor to the original whale oil plant installed in the first Whitby gasworks in 1827.

Cost and quality control

A GAS fire that failed to light in a Liverpool office some years ago sparked off unexpected and far-reaching results. For Mr. C. H. Leach, now Chairman of the Southern Gas Board, whose fire it was, questioned whether he alone was singled out by a vindictive fate to suffer this sort of irritation—or whether the same thing happened to other gas fire users, too. The result was the introduction of random inspection of district work, later to be known as quality control.

In his paper, 'Quality and Cost Control on the District,' presented earlier this year to the London and Southern Section of the I.G.E., Mr. B. G. H. Clegg, Market and Operational Research Manager, Southern Gas Board, describes these early beginnings in Liverpool, which he directed. He goes on to give a detailed analysis of the rapid progress made since he put a quality and cost control system into operation in the Southern Gas Board some two and a half years ago.

Mr. Clegg's paper, an abstract of which appears in the September issue of *Gas Service*, is most instructive. For these two systems of control—to which it is hoped before long to link method study—are doing much to eliminate inefficiency, unnecessary effort, and waste.

The author describes the quality control system as 'supervision plus' of the quality of work done on the district by gas fitters and maintenance men. It is carried out in the first instance by quality control supervisors—each of whom is himself an ex-fitter and top supervisor—who observe and report to management. The end product of their activities, says Mr. Clegg, is a 'clear background to policy decisions and a continuous index of the quality of work done for the customer.'

Many interesting facts have come to light since this work was started in the Southern Gas Board early in 1958. The first project was a survey of some 4,600 installation jobs performed by the Board fitters. It revealed that one job in three had been carried out incorrectly or incompletely, many jobs having more than one fault. A particularly valuable application of these findings was their use by the Training and Education Officer in the instruction of apprentices, fitters and supervisors—thus leading to prevention rather than cure. The survey report was, of course, also widely distributed to make everyone 'quality conscious,' as Mr. Clegg puts it.

There followed a domestic installation survey; a survey of jobs done by contractors—which proved contractors' work to be inferior to that of Board employees; a survey of emergency work; and a survey of water heater maintenance. One of the most revealing was the next undertaking which dealt with appliances sold on a supply only basis: Here many jobs were found to be in a shocking state, and some highly dangerous.

Next came a most valuable 'survey of surveys'—which demonstrated an urgent need for the development of standard kits; a survey of meter installations; the testing of a proposed hearth fire kit; and an investigation into cooker re-fixing. Appliance tests, market research, and damage to enamel—which costs the industry hundreds of thousands of pounds a year—followed.

The overall result of this work so far has been an all-round improvement: 'Management at all levels,' says Mr. Clegg, has become 'very conscious of the comparisons made between regional, team, and individual results. The fitters, too, know that any job may be picked at random and included in a top management report. The pressure is thus maintained at all levels.'

Cost control—which forms the subject matter of the second half of the paper—also traces its origins back to Liverpool. At first the audit of clerical work was put on a quality control basis with random sampling and control charts. The concept of extending the principle to sample costing followed logically, though for a time it remained no more than an idea.

Mr. Clegg describes how the idea later became a reality, based on the comparison of installation costs with length of pipe and the quarterly calculation of regression lines, but was soon discarded because of the immense amount of arithmetical work involved.

Indeed, it was not until the author and Mr. W. Hyde decided, in the Southern Gas Board, to combine the ideas of sample costing and regression analysis and to couple them with the hired services of an electronic computer, that progress was made.

The great virtue of the system is the saving in time and clerical effort which it bestows by virtue of the fact that it analyses a representative sample of cost items only instead of all of them. It thus provides estimation to the degree of accuracy necessary for practical purposes only, and dispenses with the wasteful—and quite unnecessary—process of calculating to within fine limits of accuracy.

It may be that cost control can provide the key to the only thing which may revitalise the fitter's approach to his work—namely, a comprehensive and bold incentive scheme.

The combination of a quality and cost control system is infinitely flexible, and clearly only the surface of its potential has so far been scratched. As the author says, it is astonishing that the method is not more widely used both in the industry and in other fields.

CHEMICALS AND BY-PRODUCTS

The production and application of phenol and cresylic acids

By K. A. ADEY,
B.Sc., F.R.I.C.
Chief Chemist, Midland Tar Distillers, Ltd.

PHENOL, cresols (monomethyl phenols) xylenols (dimethyl phenols) and higher homologues of phenol are known collectively as 'tar acids' and this name indicates their main source, coal tar.

Coal tar is produced by several different techniques of coal carbonisation and the quality and quantity of tar acids present in it depend on the conditions under which carbonisation is effected. For example, the tar acids boiling below about 230°C. comprise some 7 to 8% of tar made in vertical retorts at gasworks, compared with 1 to 2% in that from coke ovens, where the primary product is metallurgical coke rather than gas, while the tar produced in a carburretted water gas plant contains no tar acids.

The total production of phenol and cresylic acids in Great Britain in 1959 was 18 mill. gal. made up as follows:

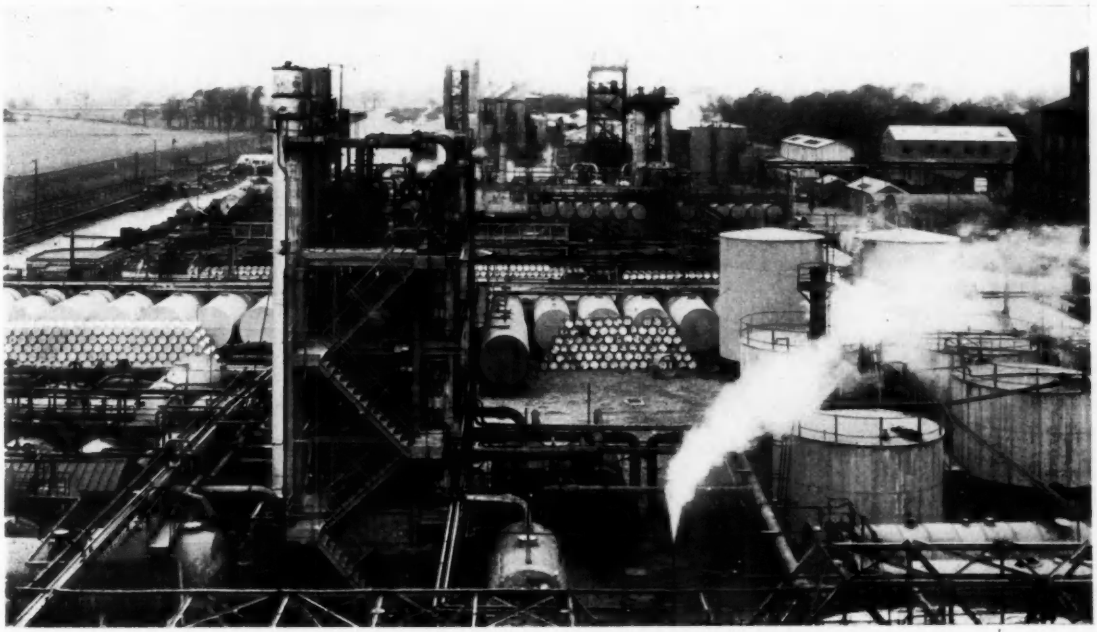
Phenol	3.6 mill. gal.
Refined cresylic acids ..	14.4 mill. gal.

In the same year the total production of crude tar was 2.80 mill tons of which 1.3 mill. tons came from vertical retorts at gasworks and 1.096 mill. tons from coke-ovens. The apparently low recovery of phenol and cresylic acids, about 3% of the tar produced, is explained, at least in part, by the fact that a considerable tonnage of crude tar was not refined but was used directly as a fuel.

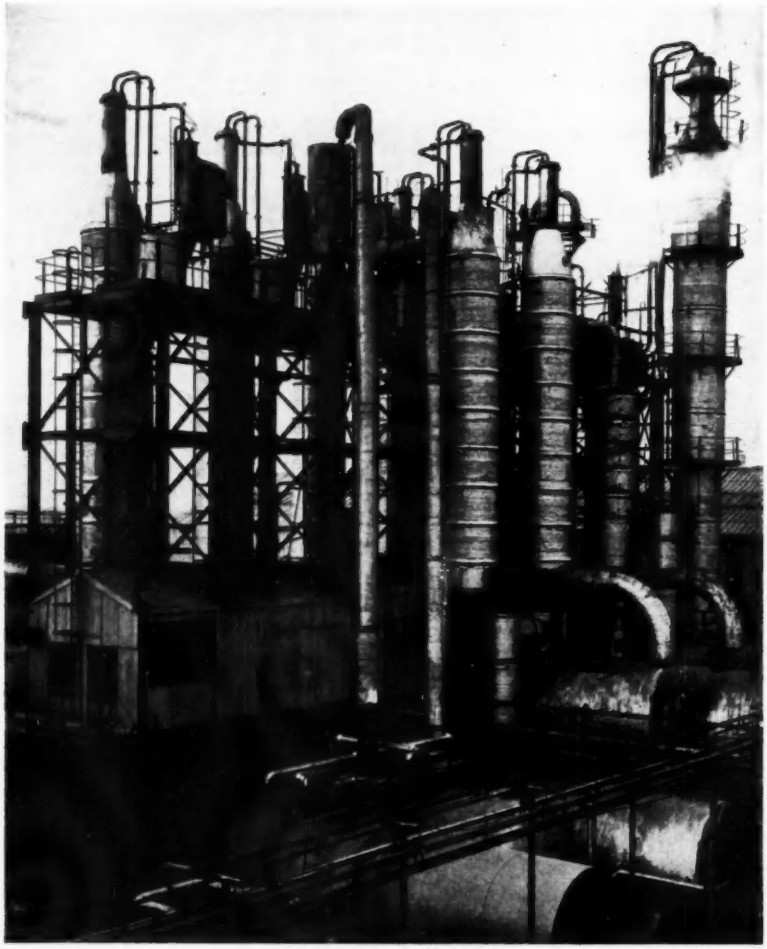
The methods of extraction, recovery and further refining of tar acids vary from producer to producer, but follow the same general principles. The tar is first fractionally distilled to yield an oil (or oils) suitable for treatment. This oil is extracted with caustic alkali and the aqueous phase (cresylate) containing the alkali metal salts of the tar acids is separated. After removal of entrained hydrocarbon oils and bases, the cresylate is treated with an acid stronger, *i.e.* having a greater dissociation constant, than the tar acids; this effects the recovery of the tar acids, which separate from the solution. They are then dried and further refined by fractional distillation in vacuo.

Variations occur at all stages of this programme. The oils may be extracted in a batch washer or in a counter-current system; carbon dioxide ($K_1 = 4.3 \times 10^{-7}$) is commonly used as the acid in the stage in which the tar acids ($Ka = 10^{-11}$) are recovered, but sulphuric acid may be employed; the final refining may be done by a single continuous distillation yielding finished products directly or by a combination of continuous and batch-wise distillations giving finer control of the final products.

The writer is associated with a company distilling tar obtained almost exclusively from vertical retorts, and the detailed procedure will of necessity be confined to the



A general view of the plant looking towards the entrance gate, with the tar acid rectifiers in the centre foreground.



The tar acids distillation unit showing the control room which is located in the centre of the steelwork.

methods practised by that company, at its refinery at Four Ashes, near Wolverhampton.

The intake of crude tar is about 350,000 tons per annum (70 mill. gal.) and this is fractionally distilled under atmospheric pressure, mainly in continuous stills, to give four crude fractions and pitch. The two lightest fractions, designated Nos. 1 and 2 fractions, have boiling ranges from 50°C. to 200°C. and from 200°C. to 230°C. respectively, and it is these oils which are treated for production of refined tar acids. The total quantity of phenol, ortho cresol and refined tar acids so obtained is about 5.3 mill. gal. or 7.6% of the crude tar input.

The No. 1 fraction is first contacted with a small amount of 10% caustic soda solution in 'disc and ring' towers. The fact that the quantity of caustic soda is insufficient to extract all the tar acids present results in the preferential extraction of the stronger acids. Thus phenol ($Ka = 9.6 \times 10^{-11}$) and meta cresol ($Ka = 8.1 \times 10^{-11}$) are concentrated in this extract, while ortho cresol ($Ka = 4.8 \times 10^{-11}$) is reduced. This concentration of phenol and meta cresol facilitates the final working up of these products. Extraction of the tar acids from No. 1 fraction is completed in a counter-current 'washer', which consists of a number of mixing and settling chambers at the same level, interconnected in such a way that counter-current flow results from the differences in density which exist between the emulsion of oil and soda in the mixing chambers and the separated phases in the corresponding settling tanks.

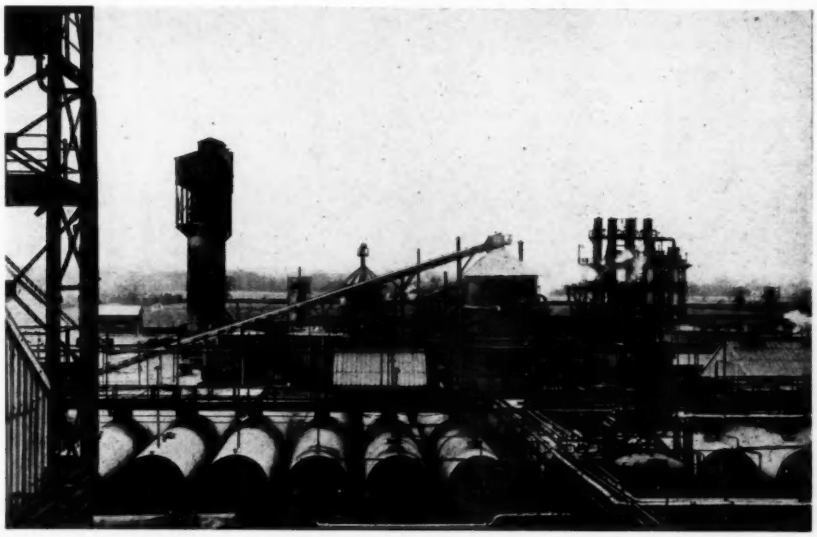
The tar-acid bearing oil is injected at one end of the washing unit and the 10% soda at the other end; this ensures that the effluent oil, containing a very small amount of tar acids, is contacted by fresh soda which is most efficient in removing these last traces of tar acids.

The No. 2 fraction, which contains very little phenol, is not given the preliminary concentrating wash applied to No. 1 fraction, but the whole of the tar acids are extracted in one counter-current washer similar to that used for the second stage of the No. 1 fraction extraction.

It may be noted, parenthetically, at this point that the tar-acid-free oils produced in these processes pass on for further extraction and refining, the No. 1 fraction yielding, ultimately, pure bases of the pyridine series, motor benzole and naphthas, and the No. 2 fraction principally naphthalene, together with pyridine bases and naphthas.

The phenol-rich caustic soda extract obtained from the No.1 fraction is known as 'carbolate', from the common name for phenol *viz.* carbolic acid, while the product of the second extraction stage is called 'cresylate', as is also the caustic soda extract from the No. 2 fraction. The two cresylates are bulked together and treated as one stream; the carbolate is worked up separately.

In the course of the extraction of the tar acids with caustic soda, small quantities, of the order of .5%, of hydro-



A view showing tar acid production plant and lime kilns.

carbons (neutral oils) and bases are entrained in the carbolate and cresylate and it is necessary to reduce them to less than .05% before recovery of the tar acids. This reduction is effected by steam distillation, in a process known as rectification.

The carbolate and cresylate, after addition of further caustic soda solution, if necessary in order to ensure that tar acids are not distilled along with the impurities, are fed to multi-plate stripping columns surmounting steam-heated stills, where the neutral oils and bases are removed in the overhead distillate. The residue in the still is 'rectified' cresylate (or carbolate) containing traces only of the impurities and concentrated by the removal of some 10% of distillate.

Distillate purification

The neutral oils, bases and any tar acids present in the distillate are recovered by contacting the distillate with unwashed No. 1 fraction, again in a counter-current washer, when these components are absorbed into the No. 1 fraction. The purified distillate is returned to the cresylate to restore the original concentration.

The rectified cresylate and rectified carbolate are pumped hot to the top of ring-packed columns up which passes a stream of carbon dioxide. This gas, being a stronger acid than the tar acids, regenerates them from the aqueous solutions of their sodium salts and in so doing forms sodium carbonate solution containing a little sodium bicarbonate. Carbonation to the stage where some bicarbonate is present is necessary to ensure maximum recovery of tar acids and low residual alkalinity in the tar acids.

The mixture of sodium carbonate and tar acids flowing from the base of the carbonating column is passed to a continuous separator. The crude carbolic acid and crude cresylic acid after further carbonation to minimise the residual alkalinity, are pumped to separate storage tanks, while the sodium carbonate from both streams is mixed and passes to the causticising plant.

In the causticising plant, fresh burnt lime (calcium oxide) is slaked with the hot sodium carbonate solution. The temperature in the causticiser rises to about 95°C. and 90—95% conversion to sodium hydroxide is obtained. The slurry of sodium hydroxide and calcium carbonate is pumped to a 40-ft. Dorr thickener where the 10% sodium hydroxide solution is continuously decanted from the settled calcium carbonate sludge and returned to the counter-current tar acid extraction plant. The calcium carbonate sludge is filtered and washed with water on a rotary vacuum filter.

The fresh burnt lime used in the causticising process is obtained by burning limestone in shaft kilns. It is the flue gas from these kilns, containing a high proportion of carbon dioxide, which is used in the regeneration of the tar acids from carbolate and cresylate.

All the constituent processes of extraction and recovery described above are operated on a continuous basis. The subsequent refining of the crude tar acids, now to be described, consists essentially of a mixture of continuous and batch-wise vacuum distillations.

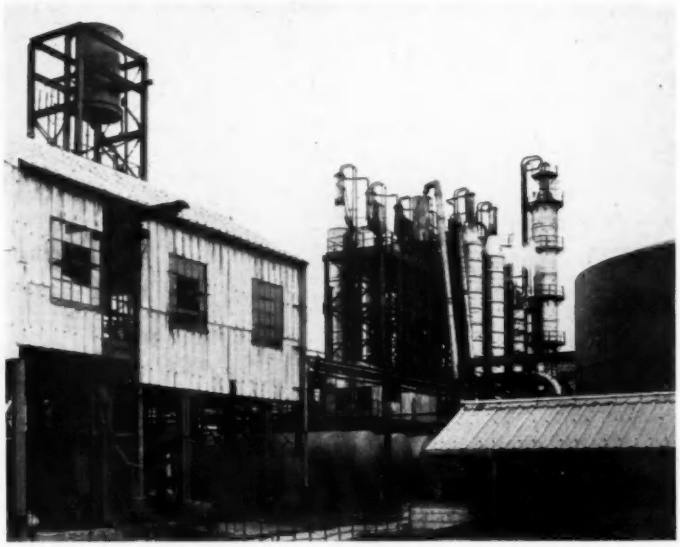
The continuous section of the tar acid distillation plant is operated alternately on carbolic and cresylic acids. In the period when carbolic acid is being distilled, the cresylic acid is put to stock and *vice versa*. Typical analyses of the two feedstocks are shown in Table 1.

TABLE 1

Constituent	Carbolic Acid	Cresylic Acid
	%	%
Water	18	12
Phenol	38	6
o-Cresol	9	10
m-Cresol	13	11
p-Cresol	9	8
Xylenols (200-230°C)	10	35
High boiling tar acids	Nil	10
Residue (pitch)	3	8

The continuous distillation plant consists of three interconnected fractionating columns and reboilers. In the first of these units water is removed as an overhead. The dehydrated residue passes to the second column where all the volatile constituents are distilled and the pitchy residue removed at the base of the column. The depitched distillate is passed on to the third column, which contains 100 A.P.V. West plates. Phenol of approximately 99% purity is taken from the top of this column; the residue at the column base, dephenolated acid, contains less than 1% phenol.

The water from the dehydrating column contains some tar acids which distil as their water azeotropes and is recycled to the tar acid recovery plant. The pitch from the second continuous unit is burnt as fuel in the power house. The phenol from the third unit is further purified before



Decol plant and tar acid distillation plant.

sale. Water is added in sufficient quantity to form phenol hemihydrate and the whole cooled until crystals of this compound separate. These crystals are crushed, centrifuged and washed with water. By this means traces of colour-forming and odoriferous materials are eliminated in the mother liquor.

The purified crystals are charged to a batch still and re-distilled. Because of the marked effect of iron in accelerating colour deterioration of phenol, this still is fitted with a nickel column top, nickel condenser and nickel run-down lines. The pure phenol—freezing-point 40.3°C. minimum—is kept in nickel clad, heated storage tanks.

The phenolated acid, which forms the residue from the third continuous unit, is fractionally distilled in batch stills of 10,000-gal. capacity, heated by steam at 275 p.s.i. and fitted with columns containing 50 A.P.V. West plates.

The distillate is separated into a number of fractions of narrow boiling range.

Ortho cresol source

The first of these fractions, comprising about 10% of the dephenolated cresylic acid and 20% of the dephenolated carbolic acid is the source of pure ortho cresol. The fraction is treated with sulphuric acid, to remove any traces of bases, and redistilled. In addition to ortho cresol of about 99% purity (freezing point 30.3°C. minimum) this distillation yields a phenol-rich fraction derived from the 1% phenol left in the residue from the continuous dephenolation column, and this is worked up to obtain pure phenol.

Meta cresol—boiling point 202.2°C.— of similar purity cannot be obtained by fractional distillation since it cannot be separated from para cresol—boiling point 201.9°C. Separation can be effected, *e.g.* by the sulphonic acid derivatives of these compounds, but this is not practised by the author's company. A product containing about 58% meta cresol and 38% para cresol is obtained from the redistillation of dephenolated carbolic acid and is sold as such.

Similarly 2, 4-dimethyl phenol (2, 4-xylenol), of boiling point 210.9°C. cannot be separated by distillation from the 2, 5-isomer, boiling point 211.1°C. Here, again, the appropriate fraction is redistilled to obtain sales products containing a maximum of about 65% of 2, 4-xylenol. The remaining fractions from both dephenolated carbolic and dephenolated cresylic acid distillations are blended in different ways to produce a range of refined acids, known generally as 'cresylic acids.'

The qualities of refined cresylic acids are closely controlled to conform with about 40 specifications ranging from the 'cresol' of the British Pharmacopœia to cresylic acid conforming to the 'duty-free' specification of the U.S. Customs laboratory.

Meta cresol is an example of an important constituent, since it influences the behaviour of cresylic acids used to manufacture resins of the cresol/formaldehyde type. An idea of the multiplicity of grades of cresylic acid made is given in Table 2 in which the meta cresol content is specified.

TABLE 2

	m-Cresol content	o-Cresol content
	%	%
1	55—60	
2	52—53	
3	49—51	
4	40—42	10—15
5	40—42	3— 8
6	40—42	0— 3
7	30—35	
8	25—30	
9	23—28	
10	20 max	

Specification by boiling range is common practice and in this respect cresylic acids vary from 190 to 200°C. for 'mixed cresols to 230 to 260°C. for 'high-boiling tar acids.'

Non-phenolic impurities are, for obvious reasons, kept to as low a level as possible and in the great majority of cresylic acids the total of these impurities (neutral oils, bases and water) is appreciably less than 1%; in some cases it does not exceed .2%. It may be noted here that the prevention of the ingress of water is one of the great problems of the tar acid refiner. The acids are hygroscopic and must not, therefore, be exposed to the atmosphere for any protracted period. The problem is particularly acute in connection with those products, *e.g.* phenol and ortho cresol, which are specified by a minimum freezing point; for the

freezing point of a product containing 99.8% phenol and .2% water—40.2°C.—is lower than that of a completely dry mixture of only 98.8% phenol and 1.2% ortho cresol—40.3°C.

Colour also presents problems to the refiner. All cresylic acids darken to a greater or lesser degree on storage for a prolonged period and many processes and additives have been investigated either to remove the minute traces of bodies which accelerate colour formation or to inhibit their activity. Very pale, colour-stable acids are produced by the Decol process invented by the author's company.

Specialised tests carried out in connection with specifications include the determination of the time taken to form a resin of the phenol-formaldehyde type, the determination of primary amines present to the extent of about .02% in one particular cresylic acid and the formation of trixylenylphosphates.

Consistent composition

Many of the uses of cresylic acids involve their reactions with other raw materials to give products whose properties, *e.g.* hardness and transparency, may depend on the composition of the acids. For this reason the customer wishes to ensure that his supplies are of consistent composition. It is therefore necessary to analyse cresylic acids for some or all of their constituents and to control the blending of the fractions to hold these constituents within narrow limits. Reference to Table 2 showing the meta cresol contents, will show that this component must in many instances be kept within a 2% range and in one case within 1%. Analytical methods for phenol and the three cresols are well-established and methods exist for a few xylenols, but it is not possible at present to analyse completely many of the cresylic acids, because of the complexity of their composition.

Modern analytical instruments such as the infra-red spectrophotometer and, particularly, the gas-liquid chromatograph are of great assistance in facilitating these analyses. Development of the latter method, especially in the direction of the establishment of a technique to give reliable and reproducible quantitative, as opposed to qualitative, results appears to be the most likely solution for complete analysis.

Phenol finds its main application in the production of thermosetting phenol/formaldehyde resins which are used in moulding powders, laminates, adhesives and paints. It is also the starting material for the synthesis of aspirin, nylon and the weedkillers 2.4D (2, 4-dichloro phenoxy acetic acid) and 2.4.5T (2, 4, 5-trichloro phenoxy acetic acid.) Ortho cresol, also, is used in the manufacture of fungicides and weedkillers *e.g.* D.N.O.C. (dinitro ortho-cresol) and M.C.P.A. (methyl chlorophenoxyacetic acid).

Cresylic acids containing m-cresol as a major constituent are used extensively by the plastics industry in the manufacture of thermosetting resins for industrial and domestic laminates and for use in adhesives, paints and brake linings. Tricresylphosphate (a plasticising agent) and synthetic tanning agents are also made from these acids.

Cresylic acids of low boiling range (190 to 205°C.) containing cresols and xylenols, find outlets in the production of Lysol type disinfectants, synthetic tanning agents, soluble cutting oils and hand cleaners. They are used as gum inhibitors in motor fuel, in the 'solutizer' process for the removal of sulphur compounds from petroleum and for vaporising in the sick room in cases of bronchitis.

Medium boiling range cresylic acids (205 to 220°C.) are used in 'carbolic' soap, as mercerising agents for cotton, for froth flotation of ores and in the manufacture of pre-emergence weedkillers, in addition to uses which they have in common with the low boiling range acids.

Cresylic acids of boiling range 210 to 230°C. conform to the 'duty-free' specification of the U.S. Customs Authorities, but are not confined to sale in America. Large quantities are used as solvents for Formvar, polyester and polyurethane wire enamels, for conversion to resins for brake and clutch linings, in degreasing fluids and in the production of trixylenyl phosphate plasticisers.

High boiling tar acids (230 to 260°C.) are employed mainly in disinfectant fluids and sheep dips. Pre-emergence weedkillers made from them are increasing in popularity.

It is not possible in so short an article to do full justice to the subject matter. The author hopes, however, that this outline has given some insight into the methods of production and the applications of an important group of tar products, which as well as meeting home demands, is sold in very considerable quantities in the export market.

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WHITBY — Britain's No. 1 natural gas town

● FULL TECHNICAL DATA ON THE NEW PROJECT

WHITBY, with its 12,000 inhabitants, is the first town in Great Britain to be supplied exclusively by natural gas. Elsewhere in Britain isolated quantities, notably at Cousland in Scotland, have been regarded as additions to existing grid supplies, and have contributed to the general availability of gas in a wider area. At Whitby, however, the existing horizontal retort plant has been completely superseded by the output from two natural gas wells in the vicinity.

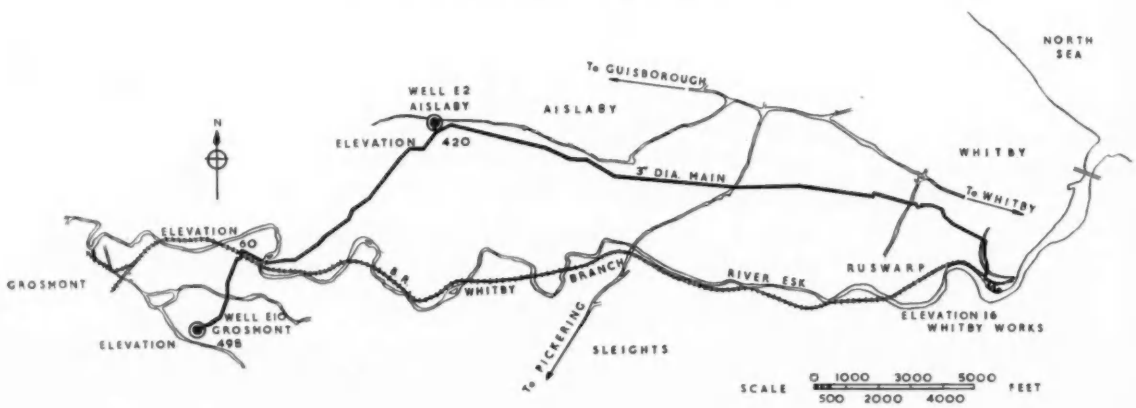
Although this natural gas might be utilised without further treatment other than purification, the North Eastern Gas Board have decided to reform it to a G5 gas with a calorific value of 500 B.t.u. per cu. ft. This decision is based on the incomplete knowledge so far available as to the total reserves of natural gas in the area. Should they prove to be far more extensive than that calculated from the available information, the Board might possibly consider distributing it without reforming after the adjustment of all gas-burning equipment and appliances in the area of supply.

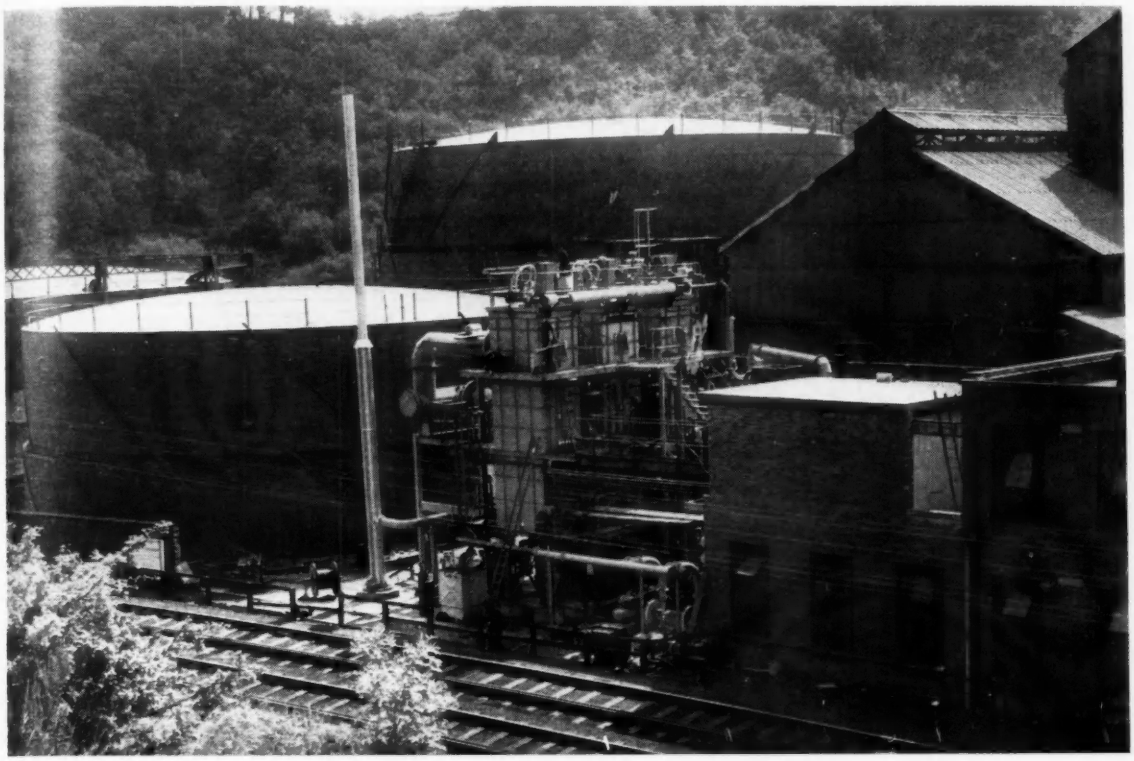
WHITBY source of natural gas was originally discovered by the British Petroleum Exploration Company in 1938, while searching for oil in the U.K. Since the war it has been explored jointly with Imperial Chemical Industries Ltd., which considered it as likely to be of use to the chemical industry. Proving insufficient for this purpose, the gas is now being sold to the North Eastern Gas Board as it becomes available.

Of the 11 wells drilled during the exploration, only two, Nos. 2 and 10, have proved gas producers, all others being dry, but both are independent of each other and do not draw gas from a common reserve.

With a closed pressure of 1,700 p.s.i., No. 2 well draws gas from an upper limestone layer 4,196 ft. below surface level and is capable of a production rate of 2.5 mill. cu.ft. per day. No. 10 well with a closed pressure of 1,900 p.s.i. draws its gas from a lower limestone strata 4,807 ft. below ground level and can supply gas at a daily rate of 2 mill. cu.ft. The total producible reserves from the two wells has been estimated at 1,600 mill. cu.ft., but it is thought

FIG. 1—*The route of the natural gas line.*





General view of Whitby gasworks, showing reforming plant.

possible that this quantity may well be greater by as much as 2,500 mill. cu.ft.

The two wells were mud-sealed and capped until April, 1960, when they were reopened and fitted with new casing heads and 'Christmas tree' control valves. The analyses of the gas from each well are shown in Table 1.

TABLE 1

Constituent	Aislaby No. 2 well %	Grosmont No. 10 well %
CH_4	93·17	93·93
C_2H_6	·79	1·87
C_3H_8	·43	1·56
C_4H_{10}	·10	·38
CO_2	·28	·23
N_2	5·23	2·03
H_2S	Nil	30 grains/ 100 cu. ft.
Organic sulphur ..	Nil	Nil

The average calorific value of the gas is approximately 1,000 B.t.u. per cu.ft., and the specific gravity .59.

Fig. 1 shows the relative position of the two wells to the Whitby works. After de-watering and pressure reduction at the well head, gas is brought by a 3-in. steel main directly to the Whitby gasworks. After pressure and flow control, it passes through oxide purifiers to remove any H_2S into a methane holder, from which gas is taken at low pressure directly to a P.G. Hercules plant supplied by P.G. Engineering Ltd., for reforming the methane to hydrogen and carbon monoxide. This is followed by cold enrichment with methane to a group 5 gas of 500 B.t.u. per cu.ft., and a specific gravity of .54.

This gas wholly replaces the town gas, now made in horizontal retorts with producer gas dilution. To allow for any temporary interruptions of flow of natural gas from the wells, provision is made for reforming butane to a gas of the same approximate composition.

The whole plant was only put into commission a few weeks ago, so it is not yet possible to give any information on its operation or performance.

Fig. 2 shows a diagrammatic arrangement of the well-head equipment installed by British Petroleum Ltd. at both the No. 2 and No. 10 wells. The valve arrangement at the well enables gas to be taken either from the centre tube or from the annulus and its flows directly to a separator for knocking out any free water, although it is anticipated that free water will be absent at the flows being operated. The separator is 12 in. diameter and 5 ft. long, suitable for a working pressure of 2,000 p.s.i. The separator is fitted with a liquid level controller and a diaphragm-operated water discharge valve. A relief valve is also fitted, with a direct connection to a vent stack with a flame-trap head.

From the separator the gas passes through a horizontal gas-fired heater, 24 in. diameter and 10 ft. long, required to overcome freezing conditions which could arise from adiabatic expansion of the gas and the Joule-Thompson effect. Prevention of ice and methane-hydrate formation is necessary to ensure continuous operation of the pressure reducing equipment. The fire tube of the heater is immersed in water, which is the heat transfer medium. The hot water heater is fired by natural gas and the burners are thermostatically controlled. The tube bundles are arranged in two passes—an arrangement which permits the required heat transfer to the gas to take place at a lower temperature than would be possible with a heater having only one bundle of tubes—so a greater heat transfer is obtained for a given surface area.

The gas passing through the first tube bundle is heated

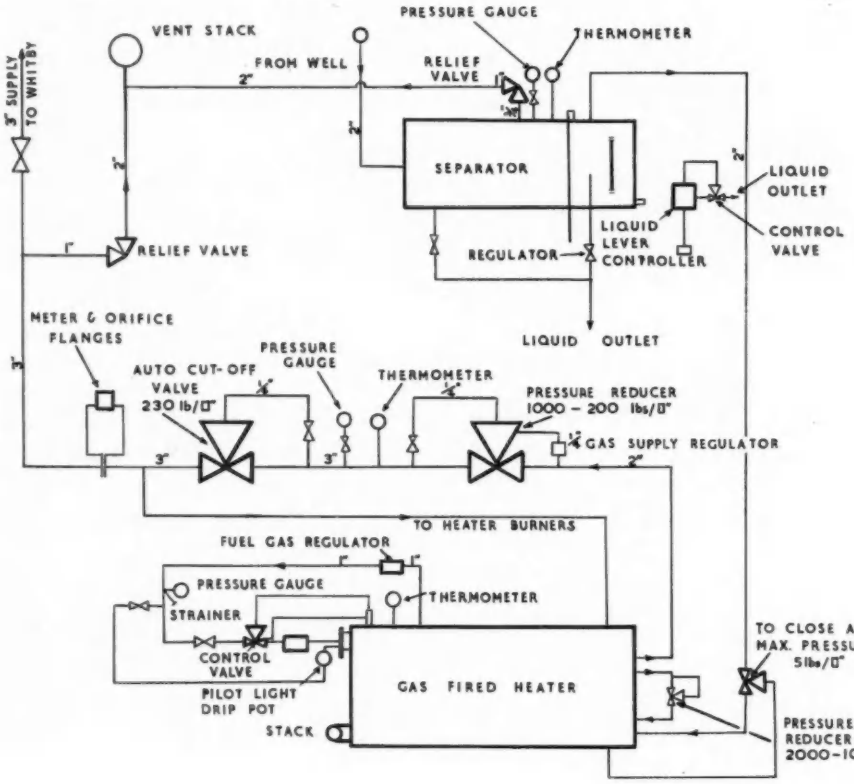


FIG. 2 — *Diagrammatic arrangement of well-head equipment.*

to 150°F. It is then cooled to approximately 70°F. on being expanded from 1,900 p.s.i. to 1,000 p.s.i. After passing through the second tube bundle the gas is reheated to 150°F. and subsequently cooled to 70°F., after expanding from 1,000 p.s.i. to 200 p.s.i.

To protect the transmission line, two safety valves have been incorporated in the surface plant. The safety shut-off valve is set to shut off at 230 p.s.i. and the safety relief valve set to operate at 260 p.s.i. This latter valve is included to protect the system in the event of the shut-off valve not working. The discharge pipe from the safety relief valve is also connected to the well vent stack. The gas supply to the burners is taken from the outlet side of the safety shut-off valve and the supply line is pre-heated through the gas-fired heater.

Official gas metering is carried out at Whitby works, but the well surface plant does include an orifice plate meter.

Gas from the well heads is transmitted directly to the Whitby works through approximately 6 miles of 3-in. steel main, which is capable of carrying the full anticipated requirements, with an initial pressure of 200 p.s.i. and a final pressure of 90 p.s.i. The initial pressure of 200 p.s.i. provides a pressure reserve at the well head to ensure the full effective capacity to be utilised as the flow pressure from the well falls off in course of time. The terminal pressure of 90 p.s.i. at the Whitby end, in conjunction with the initial pressure of 200 p.s.i. at the well head, ensures the full carrying capacity of the 3-in. main, with a limitation on the gas velocity at a maximum of 40 ft. per second.

The line is laid as far as possible across country, avoiding built-up areas; in fact 99% of the mainlaying is through farmland and only three public roads are crossed. The work of laying the main began in April 1960 and was completed at the beginning of July 1960. About 24 wayleaves were negotiated, and the laying involved 16 special crossings which, apart from road crossings, included three railway crossings and a pipe bridge over the River Esk. The pipelaying contract was carried out by Norwest Construction Co. Ltd. to a close specification.

The pipe used was 3-in. outside diameter by 5 s.w.g. hot-finished seamless steel tubing, manufactured from A.P.I. 5L, grade 'B' material with ends sized and bevelled to A.P.I. Standard 5L (17th Edition). The tubing was painted internally with red lead paint, coated externally with bituminous solution primer and further protected externally with woven glass reinforced bitumen sheathing, factory applied. Pipes were approximately 30 ft. long and on delivery the sheathing was checked for 'holidays.'

Joints were welded by the uphand method. Each weld was inspected visually for external defects; in addition all welds on the special crossings were radiographed, together with 45% of the line welds, to detect any lack of or excessive penetration. The radio-active source was Iridium 192, 4 mm. by 4 mm., using Kodak Industrex 'D' type films and .005-in. lead foil screens front and back. The distance between the source and the film was 3½ in., the 'bomb' being laid on the pipe to radiograph the weld. The whole of the line was 'holiday' detected by an inspector using a rolling electrode or brush electrode, as conditions dictated. No pipe was allowed to be lowered into the trench until all holidays were repaired.

Five Donkin Fulbor, class 150, valves have been installed on the line, with a further four valves at the pig launching and receiving traps. These traps are permanent installations, the launching trap being located above ground at the Grosmont well and the receiving trap in a chamber adjacent to the Whitby works.

The transmission line was submitted to an air test of

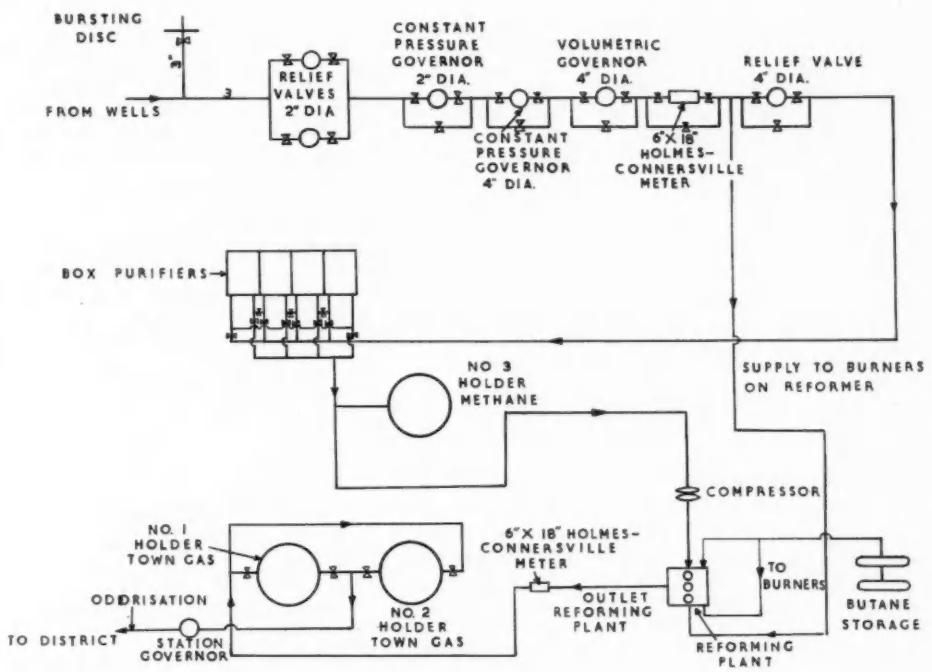


FIG. 3 — *Diagrammatic arrangement of Whitby works equipment.*

300 p.s.i., carried out in two stages; an initial test on each 1,000-yard section and a final test on the completed line. At each stage the test was split into three phases:

1. Twelve hours at 100 p.s.i., using a Nash-Thompson instrument to check any pressure difference.
2. Twenty-four hours at 300 p.s.i., the pressure being recorded on a Bristol recording instrument.
3. Twelve hours at 100 p.s.i., checking again with a Nash-Thompson instrument.

Upon completion the line was 'pigged.' The pig, equipped with a radio-active isotope, was inserted in the launching trap, and with an applied air pressure of 20 to 30 p.s.i., took 15 minutes to travel the full length of the main. A Geiger counter stick was available to locate the pig, had it become fast anywhere along the route.

The pipeline is cathodically protected by an impressed current system. The 24-V, 10-A transformer rectifier equipment is pole mounted, and the ground bed consists of eight 2½-in. diameter by 5-ft. long impregnated graphite anodes laid in gypsum and coke breeze backfill. Both are adjacent to the Aislaby well on a site selected after an extensive soil resistivity survey along the whole route.

Fig. 3 shows in diagrammatic form the plant and equipment installed at the Whitby works. The pressure reducing

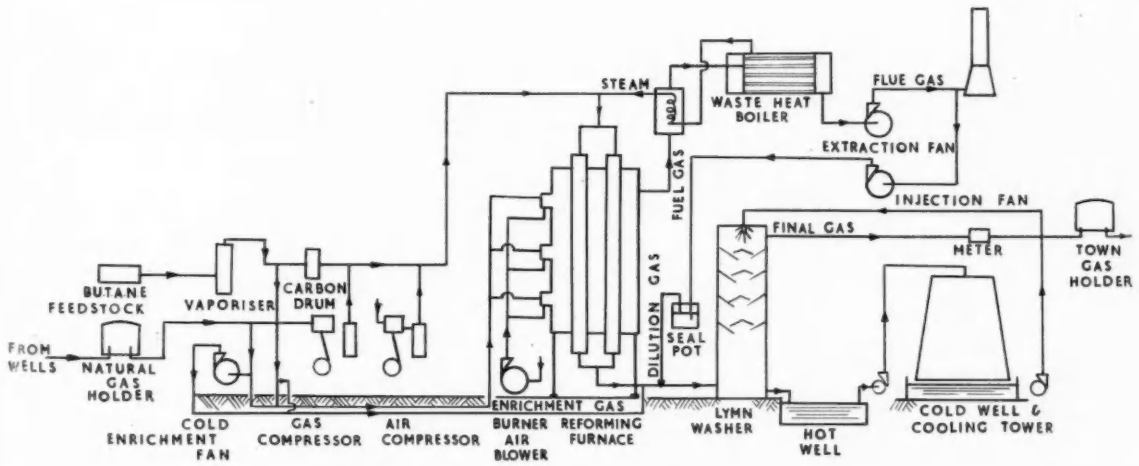


FIG. 4—*P.G. Hercules plant for reforming natural gas to town gas.*

and flow control equipment was designed and manufactured to the Board's requirements by the Bryan Donkin Co. Ltd., of Chesterfield, and installed by the Board.

The gas received at the works first passes through a screen box and then through a high pressure relief valve. The relief valve allows gas to pass if the mains pressure exceeds a figure adjustable from 75 to 100 p.s.i. The valve will remain open as the pressure increases until the outlet pressure reaches 200 p.s.i. At this pressure, which is also adjustable, the relief valve serves as a reducing governor so that the set outlet pressure is not exceeded. The screen box and relief valve are both duplicated to facilitate cleaning and servicing.

The gas then passes through a two-stage governing system which reduces the pressure to 10 p.s.i., followed by a volumetric governor which keeps the flow constant, irrespective of variations in outlet pressures.

The volumetric governor is fitted with a pilot governor which closes the main governor if an adjustable pressure of from 2 to 5 p.s.i. is reached at its outlet. A further regulating pilot governor is also fitted, which can be brought into service by manual or automatic operation and allows the volumetric governor to be over-ridden and serve as a pressure regulator limiting the outlet pressure from .5 to 2 p.s.i. to maintain supply to the reforming plant burners when the holder is full.

Incoming gas measure

A 6-in. by 18-in. Holmes-Connersville meter situated between the volumetric governor and the low pressure relief governor measures incoming gas for accountancy and royalty purposes. The meter is fitted with a P.V.T.T. recorder.

As an extreme precaution against any fault arising at the well head equipment and to safeguard the pipeline, a 'bursting' disc has been designed to allow pressure in excess of 260 p.s.i. to be discharged to atmosphere.

The two stage high pressure governing system is fitted with duplicate auxiliary governors so that if any one fails the other will take over control with a very small increase in pressure. Both first and second stage governors have secondary main diaphragms to take over control if the first should fail.

The first stage governor normally reduces the pressure from 200 p.s.i. to 20 p.s.i., but should the main diaphragm fail, to 24 p.s.i. If the secondary diaphragm also fails the pressure connection to the auxiliary system is also automatically sealed and the governor opens fully and the second stage governor takes full control, *i.e.*, reducing the pressure from 200 p.s.i. to 10 p.s.i. The second stage governor also has two main diaphragms so that if the main diaphragm fails a secondary diaphragm takes over and controls to 14 p.s.i.

In addition to these precautions, a special relief valve is fitted which will discharge the gas to atmosphere, should the outlet pressure from the governor exceed 25 p.s.i.

The producible gas reserves are not yet exactly known, but steps are being taken to verify and accurately assess them, so it was decided that the natural gas should be reformed to the same quality as the coal gas it replaces. This is carried out in a P.G. Hercules plant over a nickel catalyst. In the operation of the reformer furnace, a maximum total sulphur content in the feed gas of .5 grains per 100 cu.ft. only can be tolerated without the efficiency of methane reforming becoming adversely affected.

Though gas from both wells is free of organic sulphur, and that from No. 2 well is also free of hydrogen sulphide, the gas from No. 10 well contains an appreciable amount of H_2S, so it is necessary to remove this inorganic sulphur prior to reforming. Gas at low pressure from the regulating equipment therefore passes through existing oxide purifiers to a methane storage holder, which was previously one of three town gas storage holders.

This holder serves to even out any irregularities in quality and quantity of delivery, and even allows short interruptions of supply which may be required for clearing the pipeline and equipment of water or other accumulations. Gas from the holder passes directly to the reforming plant, which is shown with ancillaries, diagrammatically in Fig. 4.

In the P.G. Hercules reforming process, the catalyst is contained in special quality, externally heated metal tubes, which are disposed vertically in a refractory lined furnace. The methane, together with a predetermined quantity of superheated steam and air, are injected into the top of each tube and flow downward through the catalyst to be reformed to hydrogen and carbon monoxide. The reactions are endothermic, so heat must be applied continuously. This is accomplished by burning natural gas in the furnace combustion chamber surrounding the tubes. The burners are designed and located to ensure a uniform temperature, and maximum heat transfer is achieved by the flue gases flowing countercurrent to the process gas within the tubes. The gaseous mixture in the tubes reaches a temperature of 900°C. and the reformed gases leave the bottom of the tubes at about 700°C.

The reformed gases, with a calorific value of about 290 B.t.u. per cu.ft., are enriched with cold natural gas to the desired calorific value of 500 B.t.u. per cu.ft., and after being cooled in a Lymn washer, pass into the town gas storage holder for distribution.

A cooling tower in a closed circuit provides cooled water for circulation over the washer and so avoids any possible pollution of the adjacent River Esk by effluent.

The plant itself comprises three Hercules reforming two-tube units, the output from each of which is .625 mill. cu.ft. per day of town gas. Initially only one unit will be operated, but later, when reserves are fully proved, two units will be operated, with one remaining as a standby. Waste heat boilers and superheaters provide sufficient steam to enable the plant to be self-supporting in operation.

The flows of natural gas or butane for reforming and the burners, of the steam and air to the plant, and of the reformed gas, flue gas and enriching gas, are all regulated from a central point. At this point too are located the respective flow meters, pyrometers and pressure gauges. The addition of enriching gas to maintain a town gas of constant calorific value is controlled automatically by a device operated by compressed air.

Odorant is added

So that gas supplied to the town should have a distinct odour, tetrahydrothiophene is added as an odorant. Experimentally two methods for its introduction are being used; one is an electrically driven micro-pump at the inlet main to the holder, and the other is a type of vapour pick-up at the outlet main from the holder. It is yet to be determined which is the better method.

The plant will normally process natural gas, but commercial butane may be used, should there be an interruption in the supply of natural gas. Under these conditions the output of finished gas of the required characteristics will be reduced to some 80% of the rated capacity of each unit. If a specific gravity of .6 can be tolerated in the final gas, however, the output could be increased from 80% to 90% of rated capacity.

Two butane tanks with a total capacity of 90 tons, and each 9 ft. diameter by 52 ft. 6 in. long, provide standby storage. They are positioned and surrounded by a bund

Continued on p. 490.

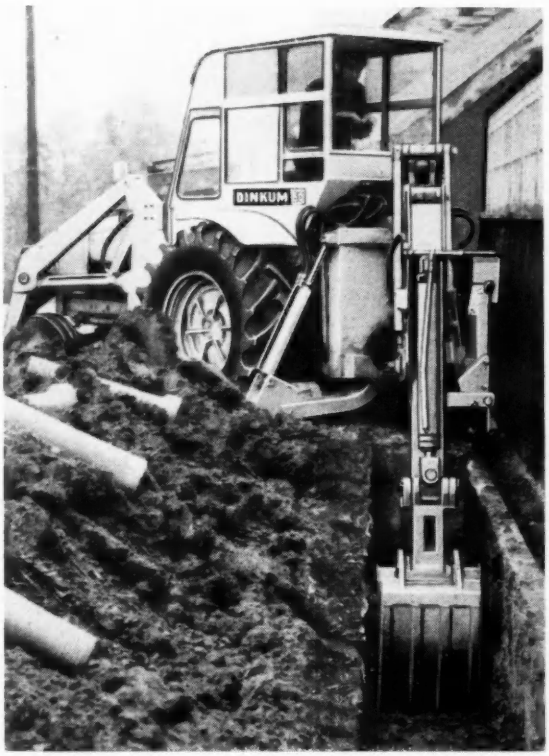
For excavating

EXTENSIONS have just been opened which add more than 100,000 sq.ft. of factory space to Whitlock Bros. Ltd. works at Great Yeldham, Essex.

The occasion also marked the introduction of a complete new range of Whitlock earthmoving equipment.

With this introduction came the announcement that negotiations have just been completed with Ransomes, Sims & Jefferies, of Ipswich, by which Whitlocks are taking over the manufacturing and marketing of the entire range of earthmoving equipment for the Ransome MG industrial crawler tractor. This new range of equipment was also demonstrated and included a dozer, dumper, skimmer and shovel, as well as a 4-wheel drive shunter.

The largest and most powerful excavator in the Whitlock range is the New Dinkum 60 which the manufacturers claim to be the 'Rolls Royce' of hydraulic excavators. Larger and even more powerful than the



The new Dinkum 60.

'Major,' this new machine certainly creates the impression of balanced power.

A new range of large capacity buckets give increased output and smooth accurate 190° slewing is provided by twin double-acting rams which are interconnected and protected by a special damping device to avoid shock loads on the machine.

Of particular interest are the new hydraulic stabilisers which enable levelling up of the machine to be carried out from the driving position. These new stabilisers, on which the manufacturers have taken out patent rights, are designed to open up from 6 ft. to 13 ft. 6 in. and provide all the advantages of stability without 'riding' and at the same time permit trench excavation close up to the walls of buildings.

The cab is certainly one which will be the envy of most site operators—giving perfect visibility all round. It has two roller-bearing sliding doors, four opening side windows, and in addition, the whole of the rear section opens up on roller-bearing slides.

The doors have built-in locks enabling an operator to leave his machine secure on the site. A valuable kit of tools in a hold-all is housed in the cab.

The roof of this cab is fibreglass, admits light, is free from drumming, and strong in construction. A padded sprung seat with backrest is provided and being placed centrally, gives the operator full view of the trench he is excavating.

A feature of this New Dinkum 60 is an instrument panel with thermometer and pressure gauges, which enables an operator to ensure that his machine is operating efficiently at all times, and with maximum output.

To operate in conjunction with the Dinkum 60 or as a separate unit, is the New Whitlock 66 shovel. Designed on modern lines of pressed steel construction, this 7/8 cu.yd. shovel is fitted with new type large capacity shovels up to 84 in. wide, double-acting crowd rams being standard equipment.

Whitlocks also claim to be the first to have manufactured dumper trailers in this country, and so it is perhaps not surprising that they have now produced a self-propelled model, the Dinkum dumper. Designed to carry 10-ton loads, the unit is built up on 4—14.00 × 2 earthmover tyres with steering activated by a system of four hydraulic rams and a valve control mechanism operated by the steering wheel.—*Whitlock Bros. Ltd.*

Technical developments

New range of compressors

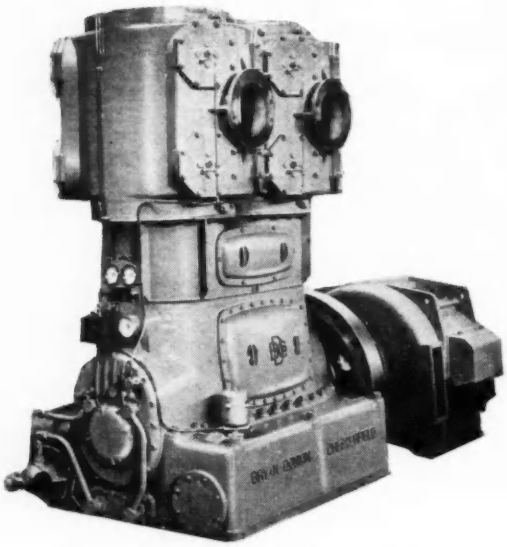
A NEW Bryan Donkin standard range of vertical reciprocating compressors, designated Type 300/A, replaces their earlier range. Rationalisation of the design, and the introduction of new production methods, has enabled the capital cost to be considerably reduced while, at the same time, the operating efficiencies have been increased.

The 6-in. stroke compressor can be supplied as a single, two or three crank machine and the eight-inch and 12-in. stroke machines are made with either two or three cranks. The maximum flow of free air obtainable with the 12-in. stroke compressor at a discharge pressure of 100 p.s.i.g. is about 3,600 cu.ft. a minute.

Drop forged connecting rods, now used in accordance with modern practice, are made in I-section and have a high strength: weight ratio. As well as reducing production costs, their use reduces the out-of-balance forces.

Special attention has been given to the interchangeability of parts. The big end and main bearings with thick wall steel backs and white metal linings, can be fitted easily without bedding in or scraping.

Designed for continuous running and the minimum of maintenance, the compressors can be easily dismanlted and reassembled for examination and maintenance when required. Of light alloy and of ample proportions to facilitate access for maintenance, the crank frame can easily be removed by one man.



The Bryan Donkin compressor.

By vertically disposing the suction and delivery valves around the cylinder walls, accessibility has been greatly improved and the removal of any valve gives direct access to the cylinder and piston for inspection.

A built-in centrifugal oil cleaner is part of the lubricating oil system and, driven by oil pressure, ensures the long life of the bearings. It removes all particles larger than 5 microns, eliminating all the abrasive matter most detrimental to bearing surfaces. The base plate incorporates a water-cooled oil cooler.

A seep-off pipe fitted to the cylinder gland on the low pressure side prevents the escape of toxic gases to atmosphere, or ingress of air during the suction stroke. These compressors are completely dust and weather proof.—*Bryan Donkin Ltd.*

Gland leakage

THE Flexibox mechanical seal, first introduced in 1945, has successfully solved the difficult problem of preventing gland leakage from pumps handling corrosive liquids, such as liquid sulphur dioxide. Sealing action is obtained by intimate contact between the opposing faces of two rings, one of which, a stationary seal ring, is held resiliently in the gland housing, while the other, a rotary seal ring, rotates with the shaft. As the rubbing surfaces are extremely flat—they are lapped plane to within a few lightbands—leakage of the fluid being handled is prevented. A flexible O-ring, rotary seal ring packing, effectively prevents leakage between the rotary seal ring and the shaft, which should be smooth and free from flaws, while allowing the ring sufficient freedom of movement to maintain full face contact. It also compensates for misalignment, swash or run-out, thermal expansion and shaft vibration. The stationary seal ring, usually made from a specially compounded grade of carbon is held resiliently by a second flexible O-ring, a stationary seal ring packing, which prevents leakage between the stationary seal ring and the gland housing. At the same time it provides a cushion for the former, which can take up a fair degree of 'out-of-squareness.' A pin may be provided to engage a slot in the stationary seal ring and thus positively prevent the latter's rotation.

Pressure between the two seal faces is supplied by a fifth component, a spring, which by gripping the shaft at one end and the neck of the rotary seal ring at the other, provides a positive resilient drive. This spring is available with either a right-hand or a left-hand coil.

From the basic design, two principal variants have been developed, one, Type RA—hydraulically unbalanced—and the other, Type RR—hydraulically balanced. A 'balanced' seal is so designed as to result in the lowest face contact pressure consistent with leak-proof performance, while in the case of an 'unbalanced' seal the contact face loading is actually higher than the hydraulic pressure being sealed.

Type RA may be applied to centrifugal and rotary pumps, gear-boxes, refrigeration compressors, mixers and agitators, and may operate between pressures from full vacuum to 100 p.s.i.g., temperatures from −130°F. to 400°F dependent on product handle, at PV factors to 200,000, and at a static test pressure of 500 p.s.i.g.

Type RR can be applied to similar machines, but operating between pressures from full vacuum to 1,200 p.s.i.g., temperatures from −130°F. to 750°F., at P.V. factors to 2,250,000, and at a static test pressure of 1,500 p.s.i.g.—*Flexibox, Ltd.*

WHITBY DATA

Continued from p. 488.

to satisfy the requirements of the local authority, the Chief Fire Officer and others.

The alternative butane feed stock is vaporised and passed through an active carbon drum to remove traces of sulphur before it enters the reforming plant.

With natural gas as feedstock and cold enrichment, and each unit producing .625 mill. cu.ft. per 24 hours of 500 B.t.u. per cu.ft. enriched final gas, falling within gas group G.5, the gas-making efficiency, calculated as therms of final gas divided by total therms of feedstock to the reformer and that used for enrichment, together with the gas required for heating is expected to be in the region of 91%.

The plant can be controlled to work down to 50% of its rated capacity, and if necessary the specific gravity of the gas made may be reduced to below .54, but in each case the thermal efficiency would fall.

With natural gas as the feedstock making a final gas of 500 B.t.u. per cu.ft., a minimum specific gravity of approximately .4 could be achieved if necessary. In this case neither air to the tubes or flue gas to the final gas would be added. The efficiency would drop to about 80% and the productive capacity would be reduced by approximately 20%.

A typical analysis of the final gas is shown in Table 2.

TABLE 2

Constituent	Per cent
CO_2	5·4
CO	7·3
H_2	34·4
CH_4	35·1
C_nH_m	·8
N_2	17·0
C.v.	500 B.t.u. per cu. ft.
Sp.gr.	·548

The plant has only been put to work in recent weeks, so the performance tests have yet to be carried out.

Speed smokeless zones demand

DISSATISFACTION with the rate at which councils in England and Wales are creating smokeless zones was expressed by Mr. James Griffiths, Labour M.P. for Llanelly, at a conference of the Association of Public Health Inspectors, at Scarborough. He said that up to last month only 171 smoke control areas, covering 19,000 acres, were created. A further 131 orders, covering 22,000 acres, were not yet operating.

'This is not the kind of response one would have expected from those local authorities in the many densely-populated industrial areas,' he said. 'It is in these so-called black areas that the most serious evils of smoke pollution are found, and it is here that action is urgently needed.'

The National Society for Clean Air said it was 'by no means satisfied' with progress made so far. Many authorities had taken advantage of the fact that the Clean Air Act, which came into force in 1956, preserved local democracy by not giving the Minister compulsory powers.

The Beaver Committee, whose report resulted in the Clean Air Act, looked to the elimination of black areas by 1971. The National Society for Clean Air believes this may not be reached by the year 2000, if the rate of progress is not accelerated.

CANADA APPROVES NEW UNITS

SPECIFICATIONS for 22 types of new commercial gas-burning units were prepared by The Approvals Section of the Canadian Gas Association during the first half of 1960.

Gas-burning equipment covered by the new specifications includes gas-fired cargo heaters, commercial dishwashers, clothes dryers, industrial heating equipment, conversion burners, hose and hose couplings, manual gas valves, propane-fired construction heaters, gas-fired domestic lighting appliances, chicken brooders, infra-red unit heaters and high altitude gas-burning equipment.

The Association has also concentrated on the preparation of specifications for gas-fired equipment for use in mobile homes and trailers.

United Gas reports £167,672 net loss

UNITED GAS INDUSTRIES reports a group net loss of £167,672 for the year ending March 31, 1960, compared with a net profit of £54,095 in the previous year, after exceptional losses of £243,428, there having been none in the previous year. The dividend on Ordinary shares is 2½%, as against a previous total of 6%.

The trading profit was £246,602 as against £279,146. The exceptional losses were almost entirely losses on tools, stocks and fixed assets which had become obsolete or redundant following changes in production policies, or as a consequence of the reorganisation of certain subsidiary companies.

All the major subsidiary companies are trading this year at least as successfully as in 1959-60 and the chairman, Mr. H. H. Bates, looks forward to a group trading profit roughly similar to that of last year, without having to charge further exceptional losses.

The reorganisation of the company's activities is still going on and, says Mr. Bates, should have been nearly completed by the end of the current year.

ANOTHER PAY RISE

WAGE increases for gas maintenance men have been agreed at a meeting between the Gas Council and representatives of the Confederation of Shipbuilding and Engineering Unions.

The increases of between 3½d. and 5d. per hour in standard scheduled rates for engineering maintenance employees will apply from September 25.

Price Problem

The Fife Housing Committee meeting in Cupar, referred to the Scottish Gas Board's recent decision to drop their proposed standing charge but to increase the price of gas, as 'manipulations in financial policy.'

The Board are to be told that the increase may have a material effect when the Committee consider future policy.

NEWS SUPPLEMENT

PLANT FOR ARGENTINE

A CONTRACT worth approximately £250,000 for a sulphuric acid plant to be built at San Lorenzo in the Argentine, has been received by Simon-Carves Ltd.

The plant will be built for Industrias Quimicas Argentinas Duperial S.A.I.C. (A subsidiary of Imperial Chemical Industries Ltd.) and will produce 207 long tons of acid per day for general sale in the Argentine, where this company is the largest supplier of sulphuric acid. In addition to the conventional acid-producing plant, the contract includes sulphur filtration equipment, a pure acid unit for the production of reagent and battery acids, and facilities for the production of 65% oleum.

The whole of the material is being supplied from the United Kingdom. Construction on the site has already begun, and the plant is expected to go into service at about the end of 1961.

COKE OVENS ARE RE-LIT

TWO batteries of coke ovens, which were rebuilt at Derwenthaugh coke works, have been re-lit.

The ceremony was performed by Mrs. Kellett, wife of Mr. A. H. Kellett, who is deputy chairman of the Durham Coal Board, and her two daughters.

After the drying-out process has been completed within the next few weeks, the 38 ovens will go into full production.

They will help to meet a growing demand for gas, and maintain the county's output of foundry coke. In 1959, Durham coke-ovens carbonised 3,300,000 tons of coal, and produced 2,300,000 tons of coke, 143,000 tons of tar, 28,000 tons of sulphate of ammonia, 8,700,000 gal. of crude benzol, and 20,000 mill. cu.ft. of gas.

Gas for brine bath

Gas heating may be installed in the open air brine swimming bath at Nantwich, Cheshire. The scheme, which would cost several thousand pounds, has been approved in principle by the Urban Council's Baths Committee.

COAL UP, ULSTER MAY HAVE DEARER GAS

AN increase in the price of gas in Northern Ireland seems likely as a result of the higher price of coal, which was preceded by the introduction of a shorter working week, and wage increases.

Mr. J. L. Hyslop, manager of the Belfast Corporation Gas Department, said that it will be up to the Gas Committee to decide whether or not to recommend an increase. The Department, which uses about 220,000 tons of coal a year, now faces an additional bill of £70,000.

The increased coal prices were described as 'very bad news for the industry,' by Mr. T. McDougall, engineer and manager of the Londonderry Gaslight Company. He said that gas prices were bound to go up, but producers would try to keep them at a minimum. The introduction of a 42-hour week and wage increases of 3d. an hour made it inevitable that consumers would have to pay slightly more.

The new coal charges will be considered by a meeting of the Gas Suppliers Board for Northern Ireland in the near future, and it is understood that an approach may be made to the Government on this question.

Gas output

THE total gas available at gasworks for the week ended September 11, 1960, was 47.6 mill. therms, according to the weekly statistical statement of the Ministry of Power. The coal consumption of the gas industry for the week ended September 10, 1960, was 359,000 tons.

Acid analysis

On p. 407 of our issue of September 14, in an article on the manufacture of sulphuric acid by Mr. K. B. Evans, Chief Chemist of A.C.C. (Brotherton) Ltd., Birmingham, a typical analysis of sulphuric acid was given showing it to contain '0.5¾ w/w as Al_2O_3.' This should, of course, have read, .05% w/w as Al_2O_3.

Main Morley Ltd. now

GLOVER & MAIN LTD., announce the merger of their two subsidiary companies, Main Water Heaters Ltd., and Morley Products (Padiham) Ltd., into the new organisation, Main Morley Ltd.

The new company will operate from the recently completed factory and offices at Gothic Works, Padiham, Lancashire, and will cover all the water heater, flue equipment and laundry appliance production carried on within the Group.

The Chairman of Main Morley Ltd. is Mr. P. D. M. Aird. Mr. F. W. Chapman, formerly managing director of Main Water Heaters Ltd. and Mr. J. H. Morley, formerly deputy chairman of Morley Products (Padiham) Ltd., have relinquished their previous appointments and have joined the board of the new company.

The Managing Director is Mr. W. K. Tate, the Sales Director Mr. G. F. Jenkins, and other Directors are Mr. C. Marley and Mr. A. G. Bazell, who are both also Directors of Glover & Main Ltd.

Mr. F. K. Morley has been appointed General Works Manager and Mr. J. M. Andrew has been promoted to the position of Sales Manager. District representation, which will cover both water heaters and laundry appliances, has been organised on an area gas board basis with the following personnel:—Mr. G. McTaggard, Scottish Gas Board; Mr. J. McWilliam, Northern and North Eastern Gas Boards; Mr. G. R. Wharmby, North Western Gas Board; Mr. N. L. Kirkup, East Midlands Gas Board; Mr. J. C. Thomas, West Midlands Gas Board; Mr. B. P. Reames, Wales Gas Board; Mr. R. D. Cook, Eastern Gas Board; Mr. J. W. Saxon, North Thames and South Eastern Gas Boards; Mr. S. A. Copley, Southern Gas Board; Mr. A. Winter, South Western Gas Board.

The sales representation in Ireland will remain as at present with Mr. W. Cole covering the whole country for water heaters and with the domestic laundry appliances dealt with by Mr. E. P. Stacey for Eire and Mr. R. F. Pollock for Ulster.

Mr. J. Emmerson has been appointed Technical Manager to the Sales Department.

Mr. G. F. Jenkins, the Sales Director, will shortly be moving to 48, Grosvenor Gardens, London, S.W.1., the headquarters of the Glover and Main Group, but otherwise the business of the company will be conducted from Gothic Works, Padiham.

PERSONAL NOTES

MR. J. WORTLEY has been appointed Managing Director of R. & A. Main Ltd. Mr. Wortley joined R. & A. Main Ltd. at their Falkirk works in 1948, and was transferred to Edmonton in 1949. The following year he was appointed assistant general manager, later becoming general manager, and in 1956 became general manager of both Edmonton and Falkirk works. He joined the Board of Directors in 1958, and became deputy managing director in 1959. Mr. Wortley has also served as a Director of Main Enamel Manufacturing Co. Ltd. since 1955.

MR. L. M. T. CASTLE and MR. N. C. MACDIARMID have joined the board of The Staveley Iron and Chemical Co. Ltd., which has recently been acquired by Stewarts and Lloyds, of which they are both Directors. Mr. Castle is Managing Director, Finance and General Administration, and Mr. Macdiarmid is also Managing Director of the Stanton Ironworks Co. Ltd.

MR. R. C. BRAITHWAITE, of the publicity department of the South Eastern Gas Board, has passed the final examination for membership of the Advertising Association, and has also been awarded the Keliher Cup for the best paper on marketing.

OBITUARY

MR. GEORGE ARCHER, president of the Mond Nickel Co. Ltd., has died at the age of 64. Mr. Archer joined the Board of the company in 1948, and became sales director in 1952 and managing director in 1955. He was appointed president in July of this year after being chairman of the company and its subsidiary, Henry Wiggin & Co. Ltd., since July, 1959.

COMING EVENTS

October 1.—EAST OF SCOTLAND JUNIORS: Social Club Rooms, Albany Street, Edinburgh. Presidential Address of D. R. Adams.

October 4.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster. 11 a.m.

October 4.—THE COMBUSTION ENGINEERING ASSOCIATION, Northern REGION: Visit to Imperial Chemical Industries Ltd.

October 4.—THE INSTITUTION OF CIVIL ENGINEERS: Great George Street, Westminster, S.W.1. 'The Utilisation and Conservation of Water in the Chemical Industry,' by J. A. Cooper and L. Gilling Smith. 5.30 p.m.

October 7. — SCOTTISH WESTERN JUNIORS: 9, George Square, Glasgow. "Retrospect on an American Visit,' by G. B. Scott. 6.30 p.m.